

PATENT SPECIFICATION

NO DRAWINGS

Inventor: RALPH BERTRAM GRENVILLE YEO

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COMPLETE SPECIFICATION

Treatment of Rimming Steel

We, RICHARD THOMAS & BALDWIN
LIMITED, a British Company, of RTB House,
151, Gower Street, London, W.C.1, do hereby
declare the invention, for which we pray that
a patent may be granted to us, and the method
by which it is to be performed, to be particu-
larly described in and by the following state-
ment:—

Rimming steel is economically desirable
because of the high yield of useful steel that
can be obtained from each cast. In addition
it has a better surface finish than aluminium-
killed steel. It is most commonly converted
into sheet, which in turn is formed into such
articles as motor car bodies. In this forming
process there may be irregular localized yield-
ing with the result that unsightly surface
blemishes are produced on the sheet and
frequently lead to rejection of articles made
from the sheet. These blemishes are known
as stretcher-strain markings.

The irregular yielding is caused by a
reduction in the stress required to produce
small elongations after the yield point has
been exceeded. A certain amount of further
deformation continues to be localized instead
of spreading. If this yield-point elongation
can be eliminated the formed sheet will not
exhibit stretcher-strain markings.

It is possible to counteract the formation
of the stretcher-strain markings by subjecting
the sheet to slight plastic deformation while it
is in the annealed state required for the form-
ing process. This slight plastic deformation
is usually effected by temper-rolling or roller
levelling, and may lead to elongation of the
sheet by from 0.75 to 5%, and usually by
about 1 to 1.5%.

Now in practice the final steps applied
to the steel by the steel maker are the anneal-
ing and temper-rolling or the equivalent, and
the sheet is then delivered either to a stock

holder or the ultimate user. In either case
it may not be formed into the final article for
some time.

One of the advantageous properties of
rimming steel is a type of age-hardening,
called strain-ageing, which slowly hardens the
steel after it has been deformed by temper-
rolling or pressing. Unfortunately an effect
of this strain-ageing is the return of the
yield-point elongation. As a result, if the
sheet is not formed within a short time after
the temper-rolling or the equivalent, stretcher-
strain markings may appear on it when it is
formed. The steel maker has of course no
control over the time at which the sheet
will in fact be formed.

Our object in this invention is to prolong
the interval of time between the slight plastic
deformation and the growth of the yield-point
elongation to a value at which deleterious
stretcher-strain markings are produced when
the sheet is formed. We do this by effecting
the slight plastic deformation at a temperature
at least as low as -78°C , that is to say the
temperature of dry ice. We prefer to effect
the deformation at a lower temperature, which
advantageously is that of liquid nitrogen
(-196°C). We find that the return of the
yield-point elongation during the strain-ageing
is considerably postponed by means of our
invention.

The effectiveness of the slight plastic de-
formation in delaying the return of the yield-
point elongation increases both as the tempera-
ture is lowered and as the extent of the de-
formation is increased. Ideally it should be
possible for the sheet to be stored for a year,
and when this is the object the deformation
should be effected at the temperature of liquid
nitrogen and amount to 5% elongation. How-
ever, a lesser period of delay is of great
practical value and may be obtained either by

usually temper rolled
while in the annealed state

- 5% elongation at the temperature of dry ice or by 1% elongation at the temperature of liquid nitrogen. The most advantageous combination of elongation and temperature is 1.5% elongation at the temperature of liquid nitrogen. 15
- 5 of stretcher-strain marking on rimming steel in which the steel in the form of annealed sheet is temper-rolled to give an elongation of at least 1% while it is at the temperature of liquid nitrogen. 20

WHAT WE CLAIM IS:—

1. A method of counteracting the appearance of stretcher-strain markings on rimming steel by subjecting the steel in the annealed state to slight plastic deformation in which the slight plastic deformation is effected at a temperature at least as low as -78°C . 20
2. A method of counteracting the appearance extension of at least 1.5%.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
51/52, Chancery Lane,
London, W.C.2.